Nordstrom DL, Vierkant RA, et al. Risk factors for carpal tunnel syndrome in a general population. Occup Environ Med 1997;54:734-40.

Design: Population-based case-control study

Population/sample size/setting:

-206 cases of CTS and 211 controls without CTS identified by computerized diagnosis files in the Marshfield Cllinic in Marshfield, WI

Main results and analyses:

- Cases were identified by charge sheet information with ICD and CPT codes associated with CTS diagnosis and therapeutic procedures between May 1994 and October 1995
- Case status was verified by documentation in the medical record of either a physician diagnosis of CTS or by any explicit treatment for CTS associated with pain or paresthesias in the hand, wrist, or forearm
- Controls had no CTS in the medical record, and were frequency matched to cases based on five age strata between age 18 and age 69
- Telephone interviews were conducted with both cases and controls by data collectors who were unaware of the purpose of the study hypotheses; the same structured questions were asked of both cases and controls
- Both work and non-work factors were asked about in the interviews
- Several analyses were done, including sensitivity analyses testing associations between risk factors and CTS under different assumptions
- Having another musculoskeletal diagnosis increased the risk of CTS by a factor of 2.54
- BMI was a strong predictor of CTS; for every unit increase in BMI, there was an 8% increase in the risk of CTS
- Use of power tools was associated with CTS; when the use of power tools was between 6 and 11 hours per day, the risk of CTS was increased by a factor of 3.3 over those having no use of such tools
- Bending or twisting hands and wrists was associated with CTS; when this occurred more than 3.5 hours per day, the risk of CTS increased by a factor of 2.65
- Low job control was associated with increased risk of CTS; those reporting the lowest control over the job had 2.86 times the risk of CTS compared to those having the most job control
- Cumulative hours in the primary job was associated with CTS; those with more cumulative hours since 1993 had a lower risk of CTS than those with the fewest cumulative hours
- Diabetes and hypothyroidism were not significantly associated with CTS
- Keyboard use , pinch grip, work in cold temperatures, assembly line work, use of solvents, workers' compensation coverage, and typing were not associated with CTS

Authors' conclusions:

- Factors most clearly associated with CTS were BMI, use of power tools or machinery, and repetitive hand bending
- Increased BMI was the strongest risk factor; the reasons for this are not clear, but possibilities include a reduction in carpal tunnel volume, associations between BMI and strength/endurance, and the design of workstations for average body size being a poor fit for larger workers
- Low job control was associated with CTS, but workers' compensation status was not
- Keyboard use was not associated with CTS

Comments:

- As with many other studies of work-related risk factors, there are difficulties with exposure measurement when self-report by interview is used to assess upper extremity activities in the workplace
- It is useful to have hours of activity reported and analyzed, if this can be used to estimate thresholds of work exposure associated with CTS
- The total number of questions in the questionnaire is not clear; if the number of questions is large, then some may be statistically significant by chance, and the Type I error will exceed 0.05
- For example, work with solvents had a bivariate p value of 0.07, small enough (less than 0.1) to qualify for testing in the logistic model, where its adjusted p value (p=0.08) was smaller than that for power tools (p=0.11)
- Since solvents have no biological mechanism for causing CTS, their presence in the bivariate and logistic analysis may be due to chance
- The p values in Table 4 are done on all levels of the variable at once, and if the dose-response relationship is not approximately linear, may appear non-significant even if a biological relationship exists
- This is one of a very few studies to use a quadratic term in the dose-response relationship for hand bending and power tool use; if the dose-response is nonlinear, using this quadratic term will clarify associations that might be obscured if only linear models are used
- The dose-response relationship for power tools has this form; the dose-response curve has a J shape (it decreases, then increases, with increasing hours of exposure)
- For power tool use (probably tools which vibrate) the odds ratio becomes clearly elevated at 6 hours per day; for bending and twisting of the wrists, the odds ratio is elevated at 3.5 hours per day

Assessment: Adequate for evidence that hand-bending and power tool use are associated with CTS (the large number of unaccounted-for questions, and the lack of a description of adjustment for multiple comparisons, preclude rating it as high quality)